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I. Executive Summary

a. Project Title and Applicant Name.

Pilot Studies for Contaminant Effects Monitoring in the Delta.

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b. Project Description and Primary Biological/Ecological Objectives. This is a proposal to conduct monitoring pilot studies for aquatic toxicity testing and fish tissue contamination in the Delta, two of the most important contaminant problems identified in the region. Because of the potential for ecological effects due to toxicity or accumulation of contaminants by fish it is important to begin to test monitoring methods and designs in the Delta where there is currently no formal contaminants monitoring program. The objective of the Aquatic Toxicity Pilot Study is to determine how frequently the ambient waters of the Delta are toxic, and how storm runoff contributes to that toxicity. The objectives of the Fish Tissue Contamination Pilot Study will be to evaluate whether contaminant concentrations in Delta fish are potentially high enough to cause biological effects in priority species, and to initiate a database on long term trends in toxic contaminants bioaccumulation in the Delta. The knowledge gained from the proposed pilot studies will be useful in designing a long-term contaminants monitoring program as part of a comprehensive water quality monitoring program for CALFED's Comprehensive Monitoring, Assessment, and Research Plan (CMARP), and Ecosystem Restoration Program Plan (ERPP)

c. Approach/Tasks/Schedule. Two, two year pilot studies are proposed as separate Tasks:

Task 1. Pilot Studies for Aquatic Toxicity Testing will monitor water toxicity two ways: First, ambient water toxicity will be monitored continuously at a key location in the Delta (Mallard Island) in order to develop an integrative measure of ambient water toxicity from the Sacramento River, San Joaquin River, and from "within" Delta sources, into San Francisco Bay. Second, monitoring of Sacramento and San Joaquin River, and "within-Delta" waters during storm runoff will occur at three sites in the Delta during storm events to determine toxicity from runoff.

Task 2. Pilot Studies of Fish Tissue Contamination will establish a committee to oversee fish contamination studies in the Delta. This is important because fish tissue contamination can be a rather contentious issues as it has implications for ecological impacts as well as public health. A committee with broad representation is essential to assure a technically sound, yet balanced approach to this issue. The technical committee would be responsible for the sampling design and data interpretation for this project. A literature review on contaminant effects thresholds in fish will also be conducted. The literature on contaminant effects thresholds in fish would allow an evaluation of whether the concentrations observed pose a potential hazard to Delta fish. Samples from a variety of fish tissue collected from several different habitats will be collected and analyzed for key contaminants of concern. The species selected for monitoring will either be CALFED's priority species or ecological surrogates with similar life histories and behavior in the

Estuary. The habitats covered would include those habitats used by the species selected for monitoring, and should include several of the priority habitats identified by CALFED.

d. Justification for Project and Funding by CALFED. Water quality is a common program area for all CALFED alternatives and is the first objective listed for CALFED's Bay-Delta Program, recognizing that restoration and engineering solutions to water supply and use cannot be successful without adequate water quality. Monitoring of water quality is of paramount importance in assessing the success of any CALFED or Category III programs for habitat restoration or contaminant source control. The two pilot studies proposed address key water quality issues identified in the region. Ambient water monitoring has detected pesticide toxicity to invertebrates and is believed to be ecologically significant for priority species. However, existing monitoring programs are not adequately characterizing aquatic toxicity due to their limited geographic scopes or timing of sampling. Knowledge of contaminant concentrations in fish tissue is essential in evaluating potential contaminant effects on fish. Knowledge of which contaminants cause aquatic toxicity and pose the greatest threats to fish populations will help target appropriate source reduction and control activities and will facilitate decisions about location and design of habitat restorations.

e. Budget Costs and Third Party Impacts. The total cost of the proposed pilot studies is $458,836 for 2 years. The Aquatic Toxicity Pilot Study cost is $ 256,870, and the Fish Tissue Contamination Pilot Study cost is $ 201,966. No third party impacts are anticipated.

f. Applicant Qualifications. SFEI is an independent, non-profit organization established to provide scientific information for management of the Bay and Delta. SFEI's Board of Directors and Committee of Policy Advisors include many people from CALFED agencies, providing a policy link to CALFED. SFEI has a proven record of excellence in conducting contaminant studies in the region through the Regional Monitoring Program (RMP), including quality assurance and data management. The Investigators for these Pilot Studies are currently participating in the RMP and the Sacramento River Watershed Project (SRWP).

a. Monitoring and Data and Evaluation. This proposal is for pilot studies related to contaminants monitoring. The methods proposed are the same as currently used in the RMP and proposed for the SRWP. The knowledge obtained from these studies will be used to design long-term monitoring components for the CMARP and ERPP. SFEI's Committee of Science Advisors will provide scientific oversight for these studies.

h. Local Support/Coordination with other Programs/Compatibly with CALFED objectives. The proposed pilot studies will be coordinated by SFEI, which currently conducts the RMP. The Principal Investigators for the pilot studies are currently conducting monitoring for the RMP and are involved in the development of the SWRP whose stations bound the Delta. The proposed studies will be fully coordinated with the two major contaminants monitoring programs and that are conducting similar monitoring in the Bay (RMP) and Sacramento River (SRWP). Both of those programs have the participation and support of a large number of federal, state, and local agencies and organizations. The proposed studies will be coordinated by SFEI, who currently conducts the RMP, and will be performed by the same subcontractors that are currently monitoring aquatic bioassays and fish tissue contamination in the region to assure full coordination and compatibility. The proposed study is directly compatible with CALFED's objective of providing good water quality for all beneficial uses.

II. Title Page

Project Name:

Pilot Studies for Contaminants Effects Monitoring in the Delta

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Type of Organization Non-Profit 501(c) (3) - Research

Tax Identification 94-2951373

Contact Person Technical - Bruce E. Thompson, SFEI
Financial - Margaret R. Johnston, SFEI

Participants/Collaborator None

Project Group Type Other services

III. Project Description. Water quality is a common program area for all CALFED alternatives and is the first objective listed for CALFED's Bay-Delta Program, recognizing that restoration and engineering solutions to water supply and use cannot be successful without adequate water quality. Monitoring of water quality, including contamination, is of paramount importance in assessing the success of any CALFED or Category III programs for habitat restoration or contaminant source control. Limited contaminants monitoring in the Delta is currently conducted by several programs but no program routinely monitors in the Delta. Comprehensive and coordinated monitoring, including contaminants, was prescribed in the San Francisco Estuary Project's CCMP for the Bay-Delta (SFEP, 1993) but has not occurred for numerous reasons. Recently, there have been renewed discussion about coordination of comprehensive monitoring in the Delta in response to CALFED's program needs. Drafts of the Ecosystem Restoration Program Plan (ERPP) and the Comprehensive Monitoring, Assessment, and Research Plan (CMARP) call for coordinated, comprehensive monitoring.

Acknowledging those needs, managers of existing water quality monitoring programs (DWR's, USGS, USBR, Sacramento River Watershed Program [SRWP], SFEI's Regional Monitoring Program [RMP], and the Central Valley and San Francisco Bay Regional Water Quality Control Boards) have begun discussions about the development of a comprehensive water quality monitoring program that will include contaminant monitoring. This interagency Water Quality Workgroup has submitted an Inquiry Submittal proposal to Category III that describes that effort: "Design of San Francisco Bay - Sacramento/San Joaquin Delta Estuary Water Quality Monitoring and Assessment Program".

While that larger planning effort proceeds, it is important to begin pilot studies on selected monitoring components. Two tasks are proposed: Pilot Studies on Aquatic Toxicity, and Pilot Studies of Fish Tissue Contamination. Those topics address two of the greatest contaminant problems that have been identified in the region. Therefore, it is important to begin immediately testing monitoring methods and sampling designs in the Delta where there is currently very limited contaminants monitoring. The knowledge gained from the proposed pilot studies will be useful in designing a comprehensive water quality monitoring program. The proposed studies will be fully coordinated with the two major contaminant monitoring programs and that are conducting similar monitoring in the Bay (RMP) and Sacramento River (SRWP). The proposed studies will be coordinated by SFEI, who currently conducts the RMP, and will be performed by the same subcontractors that are currently monitoring aquatic bioassays and fish tissue contamination in the region to assure full coordination and compatibility.

Task 1. Pilot Studies of Ambient Water Toxicity.

a. Project Description and Approach. The objective of this pilot study is to determine how frequently the ambient waters of the Delta are toxic, and the contribution to that toxicity from storm runoff. The study will use standard aquatic toxicity testing and chemical analysis to characterize water quality. Determination of the frequency of toxicity will require continuous sampling. Composite water samples will be tested for two-years at the western edge of the Delta (Mallard Island) to provide an integrated measure of the input of ambient toxicity into the San Francisco Bay from the Delta. In order to describe toxicity during runoff events, three sites will be sampled that characterize Sacramento River sources, San Joaquin River sources, and within Delta sources of toxicity. When toxicity is indicated, toxicity identification evaluations (TIEs, see Sub-task 2) will be

performed to identify the likely toxic agent. The proposed sampling design will provide a unique and comprehensive understanding of the frequency and duration of toxic episodes in an ecologically-sensitive portion of the estuary. Knowledge gained from this pilot study will allow for more informed design to be integrated into the comprehensive water quality monitoring program.

b. Location of Project. This project will be conducted in the Delta.

c. Expected Benefits. This proposal will directly benefit the CALFED mission by characterizing toxicity as a water quality stressor that may be compromising nursery areas and primary habitat for several priority fish species. Characterizing the spatial and temporal extent of this stressor is essential to design focused and effective management strategies to minimize or eliminate the causes of the toxicity.

d. Background and Biological/Technical Justification. Ambient water monitoring has detected pesticide toxicity to invertebrates. Beginning in 1988, testing of ambient water revealed that much of the San Joaquin River was toxic "about half the time" to the water flea *Ceriodaphnia dubia*. It was hypothesized that pesticides in storm and tailwater runoff were causing the observed toxicity; concurrent monitoring of two tributaries of the river revealed similarly extensive toxicity problems (Foe and Connor 1991; Foe 1995). Subsequent studies confirmed distinct pulses of pesticides, at toxic concentrations, in both the Sacramento and San Joaquin Rivers following rainfall, and tracked these pulses downstream into the Delta and San Francisco Bay (Kuivila and Foe 1995). During the three most recent RMP sampling events, water samples collected in the Northern Bay were toxic to the mysid *Mysidopsis bahia* (Thompson 1997). Given that water toxicity monitoring in the RMP occurs on a regular schedule not designed to detect episodic toxicity, this degree of ambient water toxicity is alarming and indicates that a more extensive characterization of aquatic toxicity is needed.

Ambient water toxicity is ecologically significant for priority species. A recent review concluded that toxicity detected using laboratory tests likely reflect toxicity to resident aquatic organisms in the Bay/Delta (de Vlaming 1997). This concern is heightened because most stormwater runoff enters the estuary during the time when several key fish species are spawning or present as sensitive early life stages (Adams *et al.* 1996). These species include many that have been identified as "Priority Species" by CALFED. Water flowing into the Delta can be toxic to resident fish species such as the striped bass and chinook salmon (Saiki *et al.* 1992; Bailey *et al.* 1989, 1994). Sacramento River (below Sacramento) water is toxic to fathead minnows about 50% of the time (Fox and Miller 1996). The correspondence between the RMP tests using *Mysidopsis bahia* in July, 1996 and the precipitous loss of delta smelt from the previously observed abundant year class (Sweetnam 1996) also suggests potential toxicity to fish. Toxic effects on zooplankton, such as mysids, may reduce fish abundances as zooplankton are important food for fishes.

Existing monitoring programs are not adequately characterizing aquatic toxicity. The sampling design of existing water quality monitoring programs, including the RMP, the (SRWP), and the IEP Delta Smelt Ambient Water Toxicity Study (IEP), are not sufficient to address the problem of episodic toxicity. The Department of Pesticide Regulation's (DPR) Environmental Hazard Assessment Program conducts dormant spray monitoring at several locations in the Delta, January to March. The RMP currently extends upstream only to the confluence of the Sacramento and San

Joaquin Rivers. The SRWP will extend downstream only as far as Ryer Island. The area of the Delta between these sites is considerable, and is the key nursery area and habitat for many of the resident fish species in the estuary. The IEP study will be limited to only one site. The SRWP is currently designed to sample ambient waters once per month, independent of episodic events such as rain storms; episodic occurrences of toxicity will likely be missed altogether.

e. **Scope of Work**. This project will be implemented through four Sub-tasks:

Sub-task 1. Project Management and Coordination. Task 1 will be conducted by Drs. Gunther and Ogle through direct contract with Applied Marine Sciences (AMS). Dr. Ogle is currently the Principal Investigator of the RMP Aquatic Bioassay component, thus data generated from the proposed work in the Delta would be fully comparable with data from the Bay, and would assure coordination with RMP. They will also work with the U.C. Davis group conducting SRWP aquatic toxicity testing and DPR. Dr. Thompson would serve as coordinator of this task with RMP and with the interagency Water Quality Workgroup. The proposed episodic sampling requires much more planning than normal sampling, as it is not possible to set sampling dates in advance. Equipment and crew must be ready each day that runoff is possible.

Sub-task 2. Ambient Water Toxicity Monitoring of Riverine/Delta Input into San Francisco Bay. This task will develop an integrative measure of ambient water toxicity from the Sacramento River, San Joaquin River, and from "within" Delta sources, into San Francisco Bay. Samples will be collected from the California Department of Water Resources station at Mallard Island. That station was established to be the "end of the funnel" from upstream riverine sources into San Francisco Bay. An auto-sampler (ISCO Model 3710) will collect a water sample regularly (approx. hourly) to create a composite, which will be collected three times per week (M-W-F) and used in a 7-day "short-term" chronic bioassay with *Mysidopsis bahia* (USEPA, 1994). Prior to toxicity testing, aliquots of water will be collected in appropriate containers for chemical analysis of trace elements and pesticides. If toxicity is observed, chemical analyses will be conducted and Toxicity Identification Evaluations (TIEs) will be performed to determine the likely toxic agent in the sample. TIEs are a set of toxicity-directed chemical fractionations of water samples that allow for characterization of the class of contaminant causing any observed toxicity (EPA 1991). The proposed sampling will provide continuous sampling of toxicity at a key location in the Delta. Costs for this sampling will be matched by the RMP (see IV).

Sub-task 3. Monitoring of Sacramento & San Joaquin River and "Within-Delta" Waters during Storm Runoff. Three sites in the Delta will be sampled during eight storm events for each of two years to determine toxicity during runoff events. The sites proposed are at Ryer Island, to measure Sacramento River input (and complementing the existing non-stormwater runoff SRWP monitoring at this station), at the RMP Manteca site upstream of Stockton to measure San Joaquin River input, and in the Stockton Channel immediately downstream of the Port of Stockton and Rough & Ready Island, to measure "within Delta" inputs. Water samples will be discrete grab samples and will be analyzed as described in Sub-task 2.

Sub-task 4. Reporting. A written progress report will be completed at the end of the first year, and a full report will be completed at the end of the second year of sampling and will include recommendations for long-term aquatic toxicity monitoring in the Delta. The data from the proposed study will be combined with that collected by the RMP and SWRP. Additionally, a manuscript for publication in a peer-reviewed scientific journal will be produced.

f. Monitoring and Data Evaluation. This is a proposal to develop a monitoring design for aquatic toxicity testing in the Delta that is coordinated with the other two monitoring programs in the region. The results of this monitoring pilot study will be integrated into the comprehensive water quality monitoring program specified in the EERP and CMARP. Toxicity test data will be analyzed according to standard EPA guidelines. Ambient water toxicity test data will be compared to appropriate controls to determine whether significant impairments of survival and/or growth or reproduction are taking place. For the continuous monitoring at Mallard Island, the resulting data will be used to characterize the frequency, magnitude, and duration of toxicity in ambient waters flowing into the Bay. For the episodic "stormwater" monitoring at the three Delta sites, the resulting data will be used to characterize the relative magnitude of toxicity being contributed from the various source areas. The results of TIEs will also be used to identify likely toxic agents, although it is possible that the precise cause of toxicity may not be able to be determined.

g. Implementability. No problems are anticipated in implementing this project. Agreements have been obtained to access the sampling sites, and all sampling, analysis, and QA protocols have been previously tested and proven.

Task 2: Pilot Studies of Contaminants in Fish Tissue.

a. Project Description and Approach. This Task is for the design and testing of a monitoring program for fish tissue contamination in the Delta. Toxic contaminants are abundant in the Bay-Delta and its watershed, and contaminant exposure must be considered as one of the primary stressors of Bay-Delta biota. This project will measure contaminant concentrations in fish from the Delta and evaluate the potential ecological consequences of any observed bioaccumulation. The objectives of the project will be to evaluate whether contaminant concentrations are high enough to cause biological effects in Delta fish, particularly in the priority species defined by CALFED, and to initiate a database on toxic contaminants in the Delta that would be used to monitor long term water quality improvement in response to restoration and source control activities in the watershed. This pilot study will be fully coordinated with fish contamination monitoring conducted in the Bay under the RMP, and in the Sacramento River under the SRWP as Dr. Davis is the lead investigator for fish contamination monitoring in both programs. As in the RMP, a technical committee would be assembled to design and oversee the project. The committee would include members of the RMP and SRWP committees, and some new members with interest and expertise in fish contamination in the Delta. Both committees have expressed support for a Delta Fish Contamination Committee.

b. Location of Project. This project will be conducted in Delta.

c. Expected Benefits. CALFED has identified increased contaminants as a stressor on the Bay-Delta ecosystem that may cause acute or chronic toxicity to fish and other aquatic organisms. It is anticipated that several fish species, including priority species of feasible, will be sampled from several priority habitats. The results of this project will provide information about which contaminants may be causing biological in fish, thus providing focus for future CALFED

restoration and source control programs. The project will also provide data that will be used to establish long term trends in fish tissue contamination in the Delta.

d. Background and Technical Justification. Knowledge of contaminant concentrations in fish tissue is essential to evaluating potential contaminant effects on fish. Monitoring fish tissue is a highly relevant and effective way to monitor long-term changes in contaminant concentrations in response to source control or other management actions. A health advisory for fish consumption related to mercury in striped bass in the lower Sacramento River and Delta has been in place since the mid-1970s. In 1994 the San Francisco Bay Regional Water Board conducted a pilot study of fish contamination in San Francisco Bay (Taberski 1995). That study, which was focused on characterizing potential human exposure to contaminants due to consumption of Bay fish, identified several contaminants of human health concern: mercury, PCBs, dioxins, DDT, dieldrin, and chlordane. As a result of that study, an interim health advisory has been issued by the Office of Environmental Health Hazard Assessment for consumption of fish from the Bay. Fish contamination monitoring was initiated in 1997 in both San Francisco Bay (under the RMP) and the Sacramento River (under the SRWP). However, very little information is available about contaminants in fish tissue from the Delta. Although previous studies have focused on human health issues related to fish contamination, the proposed study will focus on ecological implications of fish contamination. However, the data generated may also be useful for human health risk evaluation. The proposed work would begin fish contamination monitoring in the Delta, filling an important gap in the current monitoring structure of the region. The sampling and tissue analytical procedures to be used are the same as those used in the 1994 pilot study, RMP, and SWRP programs. They include well established protocols and rigorus QA procedures.

Proposed Scope of Work. This Task will be accomplished through five sub-tasks:

Sub-task 1. Establish a committee to oversee fish contamination studies in the Delta. This is important because fish tissue contamination can be a rather contentious issue as it has both ecological and public health implications. A committee with broad representation is essential to assure a sound, yet balanced approach to this issue. A large number of organizations have participated on the technical committees for the RMP and SRWP, including regulatory agencies, resource agencies, industry, municipal discharge agencies, environmental groups, and academics. The technical committee for this pilot study would have a similarly broad representation and would work in close coordination with the RMP and SRWP committees. The proposed committee would include some members of the RMP and SRWP committees as well as some new members (e.g. CALFED, water users), and would have an ecotoxicological focus. The technical committee would be responsible for the sampling design, data evaluation, and peer review of the reports generated in this project.

Sub-task 2. Conduct a literature review on effects thresholds of measured contaminants in fish. Initial work on this review would occur prior to design of the sampling plan. The literature on contaminant effects thresholds in fish would allow an evaluation of whether the concentrations observed pose a potential hazard to Delta fish.

Sub-task 3. Sample and analyze fish tissue from the Delta. Collect and analyze 50 tissue samples for mercury, selenium, PCBs, and organochlorine pesticides. The methods used will be the same as those being used by RMP and SRMP. The locations, times, fish species,

sizes of fish, specific tissues (e.g. muscle, liver), and other details would be determined by the committee. The species selected for monitoring will either be priority species or ecological surrogates with similar life histories and behavior in the Estuary. The habitats sampled will include those habitats used by the species selected for monitoring, and should include several of the priority habitats identified by CALFED.

Sub-task 4. Data review, interpretation, and reporting. Data will receive extensive quality assurance review, and will be incorporated into the same regional database as RMP and SRWP data. Data analysis will include comparisons with published contaminants effects levels for fish. A written report on tissue effects thresholds from the literature will be produced at the end of one year and a final report, including recommendations for long-term monitoring of fish tissues, will be completed by the end of the second year.

Sub-task 5. Contract management, administration, and coordination. This Sub-Task will be conducted by SFEI using the same subcontractors as are being used by the RMP and SWRP to insure comparability. Under this Sub-Task, Dr. Thompson will act as overall coordinator of the proposed pilot studies working with RMP and the interagency Water Quality Workgroup. Dr. Davis will coordinate with the SRWP.

f. Monitoring and Data Evaluation. This is a proposal to develop a monitoring design for fish tissue contamination in the Delta that is coordinated with the other two monitoring programs in the region. As Dr. Davis is the lead investigator in both the RMP and SRWP fish contamination programs, the data generated from the proposed work in the Delta would be fully integrated with data from the River and Bay. The results of this monitoring pilot study will be integrated into the comprehensive water quality monitoring program specified in the ERPP and CMARP.

g. Implementability. No problems are anticipated in implementing this pilot study. SFEI has all sub-contractors in place, all quality assurance procedures, and data reporting procedures. Implementation would simply require amending existing contracts.

IV. Costs and Schedule to Implement Proposed Project

Although SFEI will coordinate the proposed project, costs are presented for each Task separately. SFEI recommends that, if funded, two separate contracts from CALFED be executed. One to AMS for Task 1, and one to SFEI for Task 2, which includes costs for overall coordination. That arrangement will save subcontracting costs associated with Task 1 if SFEI were simply to administer their contract. Alternatively, at CALFED's discretion, a single contract could be executed through SFEI.

Task 1. Aquatic Toxicity.

a. Budget Costs. The total two-year cost for the aquatic toxicity Pilot Study is $256,870. A detailed breakdown of those costs are provided in Table 1. As described above, this project addresses a critical water quality stressor in the Delta, and CALFED funding is essential if the project is to be completed. Additionally, neither the RMP nor the SRWP is monitoring in the Delta and CALFED costs are necessary to fill that gap. The full two-year cost is requested, rather than phased funding, because achieving project objectives requires characterizing toxicity over different water year types.

Matching funds of approximately $45,000 for this project will be available from the San Francisco Estuary Regional Monitoring Program for Trace Substances (RMP), for sampling the Mallard Island site.

Applied Marine Sciences (AMS) will serve as the prime contractor with Pacific Eco-Risk Laboratories (PERL) as a subcontractor providing toxicological testing services and technical labor. This arrangement continues the existing relationships that have been part of the RMP since 1995. We are quite confident that as a team AMS and PERL can conduct a technically sophisticated and cost-effective project for CALFED. AMS is very comfortable suggesting that PERL provide toxicological services because PERL was the successful firm in a competitive solicitation for similar services conducted by AMS as part of the 1996 RMP. After consultation between AMS and staff of the San Francisco Estuary Institute, a bidders list was established that included three toxicological testing firms in the Bay Area with established reputations (one of these was PERL). A Request for Proposals was prepared and distributed to the firms on the bidders list. PERL provided a technically competitive proposal that was much more cost effective than any of the other competitors. As this competition was conducted recently, and PERL has performed exceptionally well in the RMP, AMS is confident that PERL will provide technically excellent and cost-effective work for CALFED.

b. Schedule milestones. The technical approach to the project requires that the program be ready to go prior to the commencement of the rainy season (October-November) in order to monitor the first flush of contaminants in early rainstorms. Quarterly reports will be produced. An annual progress report will be produced by the end of the first year. A final report including recommendations for long-term monitoring design will be completed at the end of the second year.

c. Third party impacts. No third party impacts are anticipated.

Task 2. Contamination in Fish Tissue.

a. Budget Costs. The total cost for the fish contamination Pilot Study is $201,966. A detailed breakdown of those costs is provided in Table 2. As describe above, this project addresses a critical water quality stressor in the Delta, and CALFED funding is essential if the project is to be completed.

Although no matching funds from the RMP or SRWP are available, the results of fish contamination monitoring in those programs will combine with the results of the proposed Delta monitoring to provide complementary information for much of the Bay-Delta watershed. In-kind services would be provided by the members of the technical committee that oversees the study and by the SFEI Committee of Science Advisors. This project would benefit from economies of scale achieved by association with the RMP and SRWP, making for efficient subcontract management, data management, and more rigorous quality assurance than would be possible without this association.

Sampling and analysis of fish tissue will be conducted by SFEI through subcontracts with the Department of Fish and Game's (DFG) Moss Landing Marine Laboratory (for sample collection and trace element analysis) and the Long Marine Laboratory at U.C. Santa Cruz (UCSC) (for organic chemical analysis). This arrangement would extend the existing relationships between SFEI and these labs. These subcontractors have demonstrated their ability to produce excellent and cost-effective products in the 1994 pilot study in the Bay. In addition, the selection of UCSC for analysis of organics in fish tissue was based both on the results of a competitive solicitation for RMP organics analysis in 1995. A small subcontract with a statistician will be established for review of the statistical validity of the sampling design.

b. Schedule milestones. The fish monitoring committee would be established and hold its first meeting within 30 days of the contract award. The literature review would be completed and a report produced by SFEI within one year of the start of the project. Quarterly reports will be produced A progress report will be completed at the end of the first year. Complete datasets would be delivered by the subcontractors to SFEI within 6 months of sample collection. A final report would be prepared by SFEI within 6 months of receipt of complete datasets, no later than by the end of the second year.

c. Third party impacts. No third party impacts are anticipated.

TABLE 1

Task 1	Direct Labor Hours	Direct Salary & Benefits	Overhead Labor (General, Admin, & Fee)	Service Contract	Misc. & Other Direct	Total cost
1. Project Management & Coordination	725	27,347	28,067			
travel, communications, misc supplies					662	56,076
2. Sampling & Analysis: Mallard Island	910	19,712	19,789			
toxicity tests (M. bahia); 150@$425			5,089	63,750		
Toxicity Identificaiton Evaluations (10@$750)			599	7,500		
travel, communications, misc supplies			60		749	
Auto-Sampler Use (12 mo@$300/mo)			287		3,600	121,135
3. Sampling & Analysis: Runoff sites	277	7,503	7,673			
toxicity tests (C. dubia); 48@$325			1,245	15,600		
Toxicity Identificaiton Evaluations (10@$750)			599	7,500		
travel, communications, misc supplies			64		799	
chemical analysis of toxic samples (20@$400)			639		8,000	49,621
4. Reporting	400	14,609	14,996			
travel, communications, misc supplies			32		400	30,037
Total Cost		69,172	79,138	94,350	14,210	256,870

TABLE 2

TASK II	Direct Labor hours	Direct Salary and Benefits	Overhead, General & Admin.	Service Contracts	Miscellaneous & other direct cost	Total cost
Sub Task 1 - Establish Committee	40	1,846	960		200	3,007
Sub Task 2 - Literature Review	400	18,464	9,601			28,065
Sub Task 3 - Sampling & Analysis	-	-	-	131,230	5000	136,230
Sub Task 4 - Data review, reporting	240	11,787	6,129		1000	18,916
Sub Task 5 - Mgmt & Admin & Coordination	200	10,229	5,319		200	15,748
	-	-	-			-
	-	-	-			-
TOTAL		$ 42,326	$ 22,009	$ 131,230	$6,400	**$201,966**

I-002027

V. Applicant Qualifications

San Francisco Estuary Institute

The San Francisco Estuary Institute (SFEI) is an independent, non-profit organization created in 1994 as the successor to the Aquatic Habitat Institute formed in 1983. SFEI was founded upon a diverse representation of interests, solid scientific methodology, and a shared concern for the health of the Estuary with a mission to *foster the scientific understanding and public awareness needed to protect and enhance the San Francisco Estuary.* SFEI is governed by a Board of Directors representing the interests of Bay-Delta users, the public interest in environmental protection, and government agencies. Many of SFEI's Directors are also involved in CALFED. SFEI also convenes a Committee of Policy Advisors, and Committee of Policy Advisors that advise the Executive Director.

SFEI's Executive Director works with several senior-level scientists who manage its major programs, a technical staff of analysts, data and systems managers, and administrative support personnel. SFEI also collaborates with numerous agencies and universities on its programs. Student interns from area universities often work at SFEI. This multifaceted approach allows SFEI to use the expertise available within academia and government while assuring the continuity of its programs.

SFEI conducts four major programs: The Regional Monitoring Program for Trace Substances (RMP) is a cooperative program supported by 68 federal, state, and local agencies and companies. The program is directed by a Steering Committee composed of management representatives of the participants and the San Francisco Bay Regional Water Quality Control Board, and a Technical Committee that includes technical representatives of the same agencies. SFEI administers and manages the RMP, provides scientific support, oversees quality assurance, provides data management and analysis, and produces annual reports. The RMP sampling design is based on the Bay Protection and Toxic Cleanup Program Pilot Studies conducted by the Regional Board in 1991–1992. The RMP began conducting contaminant monitoring in the San Francisco Bay and Delta in 1993. Currently, twenty-four sampling stations are located throughout the Estuary from the Sacramento and San Joaquin Rivers to San Jose and Sunnyvale. In an effort to capture seasonal variability, water sampling is conducted during the wet season (February), a period of declining flows (April), and the dry season (August). Sediment and tissue monitoring are conducted during the wet and dry weather sampling periods. Field sampling and laboratory analyses are conducted by contract. In addition to the Base Program of the RMP, SFEI also conducts Pilot and Special Studies under the RMP. Pilot Studies employ methods that are under evaluation for potential incorporation into the RMP while Special Studies help improve interpretation or collection of RMP data. The RMP is an innovative and successful program and the only formal regional monitoring program for contaminants in the state which "deserves national and international recognition" (from the Five-Year Program Review). According to the External Program Review, "data from the RMP are of very high quality and reflect state-of-the-art analysis for environmental parameters that is unequaled in a monitoring program of its size."

The Regional Wetlands Ecosystem Goals Project is identifying the types, amounts and distribution of wetlands and related habitats needed to sustain diverse and healthy communities of fish and wildlife in the San Francisco Bay Area. SFEI's scientific support of the Goals Project has resulted in the creation of *the Baylands Atlas* (in GIS).

SFEI's is developing a watershed program that includes the integration of pollutant monitoring data from stormwater and other upstream monitoring programs with its RMP estuary monitoring.

SFEI is also developing a program to pursue scientific and policy research on biological invasions in marine and aquatic ecosystems, focusing on the Estuary and its watersheds.

In conjunction with its major programs, SFEI has developed sophisticated data and information management systems to support the regional monitoring programs. SFEI's web site provides RMP data for public access, as well as the basic *Baylands Atlas* More extensive information about SFEI and its programs is available on the Internet at www.sfei.org.

Principal Investigators

Bruce E. Thompson, Ph.D.—Senior Scientist, San Francisco Estuary Institute. Dr. Thompson, a California native, is a graduate of California State University, Fresno and received his M.A. attending the Moss Landing Marine Laboratory, and his Ph.D. in biological sciences from the University of Southern California in 1982, working in marine benthic ecology. He worked at the Southern California Coastal Water Research Project (SCCWRP) for 11 years prior to joining the staff of SFEI. His research has included field and laboratory studies of the ecology of benthic communities and species off southern California, and how they are affected by contamination. He was also involved in the development of regional monitoring programs in southern California. At SFEI, Dr. Thompson directs the monitoring, research, and data management staff, and is the Program Manager for the San Francisco Estuary Regional Monitoring Program. He serves as member of the Interagency Ecological Programs (IEP) Management Team and on the Science Advisory Board for the State's Bay Protection and Toxic Cleanup Program. He has published many articles and a book chapter on benthic ecology, sediment toxicity, and monitoring program development

Jay Davis - Environmental Scientist, San Francisco Estuary Institute. Dr. Davis received his bachelor's degree in biological sciences from Northwestern University, a master's degree in environmental management from Duke University, and a doctorate in ecology from U.C. Davis. His dissertation research examined concentrations and effects of PCBs and DDTs in fish-eating birds in San Francisco Bay. He joined the Institute (then the Aquatic Habitat Institute) in 1986. He was the primary author on the Pollutant Status and Trends report in 1991 for the San Francisco Estuary Project. In the past year he has coordinated and participated in the design of the new fish contamination monitoring elements of the Regional Monitoring Program and the Sacramento River Watershed Program.

Andrew Gunther, Ph.D.— Vice President, Applied Marine Sciences. Dr. Gunther has been studying pollution problems for the last 16 years. Before joining AMS he was a founding staff member of the San Francisco Bay-Delta Aquatic Habitat Institute. Dr. Gunther is currently serving as co-principal investigator of a project investigating episodic toxicity in the San Francisco Estuary as part of the Regional Monitoring Program (RMP). Dr. Gunther also manages AMS's work for the RMP and has been responsible for overseeing the collection of chemical, biological, and toxicological samples of water and sediments in the San Francisco Bay

and Delta. Dr. Gunther is also serving as the Assistant Chief Scientist the Exxon Valdez Oil Spill Restoration Program. He was the principal investigator for the National Park Service in Alaska for a survey of the water chemistry of remote lakes in the Katmai region, where he also conducted research for the World Resources Institute regarding the impact of acid deposition on nitrogen cycling. He has also worked in the past for the Assembly of the California Legislature and an environmental advocacy group, and consequently possesses a blend of training and experience in environmental science and environmental policy. He has published numerous reports and articles in peer-reviewed scientific journals.

Richard Scott Ogle, Ph.D.—Lab Director, Pacific Eco-Risk. For over ten years, Dr. Scott Ogle has been directing and/or participating in research in the areas of aquatic ecotoxicology and environmental chemistry. A major area of Dr. Ogle's past research efforts has focused on factors affecting toxicity and bioaccumulation of selenium in aquatic systems. His current research activities include evaluation of the fate and effects of petroleum and petroleum products in the aquatic environment and the investigation of contaminants and toxicity in non-point source and storm water runoff. Dr. Ogle has directed and participated in numerous projects encompassing all of the standardized EPA and ASTM test procedures as well as projects involving research and development of new testing procedures. Dr. Ogle received his M.S. in Water Science and his Ph.D in Ecology from the University of California, Davis. Prior to joining Pacific Eco-Risk Laboratories in 1994, Dr. Ogle was a Senior Scientist at S.R. Hansen & Associates. Dr. Ogle has authored over 15 peer-reviewed publications and over 50 technical reports. He is active in several professional organizations including the Northern California Regional Chapter of the Society of Environmental Toxicology and Chemistry for which he served as Vice-President from 1990–1993 and Secretary from 1993–1994.

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VI. Compliance

Nondiscrimination Compliance Statement attached.

Competitive bids were not solicited. The same subcontractors are being used that are currently monitoring aquatic bioassays and fish tissue contamination in the region for the RMP to assure full coordination and compatibility.

Item 8

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

SAN FRANCISCO ESTUARY INSTITUTE

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME

Margaret R. Johnston

DATE EXECUTED

July 25, 1997

EXECUTED IN THE COUNTY OF

Contra Costa County

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

Executive Director

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

San Francisco Estuary Institute

Item 8

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

Applied Marine Sciences, Inc.

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME: Robert B. Spies, President

DATE EXECUTED: 7/22/97

EXECUTED IN THE COUNTY OF: Alameda

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE: President

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME: Applied Marine Sciences, Inc.

Item 12

Agreement No. _____

Exhibit _____

STANDARD CLAUSES --
SMALL BUSINESS PREFERENCE AND CONTRACTOR IDENTIFICATION NUMBER

NOTICE TO ALL BIDDERS:

Section 14835, et. seq. of the California Government Code requires that a five percent preference be given to bidders who qualify as a small business. The rules and regulations of this law, including the definition of a small business for the delivery of service, are contained in Title 2, California Code of Regulations, Section 1896, et. seq. A copy of the regulations is available upon request. Questions regarding the preference approval process should be directed to the Office of Small and Minority Business at (916) 322-5060. To claim the small business preference, ~~you must~~ submit a copy of your certification approval letter with your bid.

Are you claiming preference as a small business?

__XX__ Yes* _____ No

*Attach a copy of your certification approval letter.

Applied Marine Sciences has applied for the small business status and is awaiting a certification approval letter. We are confident that we qualify as a small business.

TOTAL P.03